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DIFFERENTIATING PAINS IN THE CHEST

With especial reference to the viscerosensory reflex of cardiac origin and to pain originating within the same roots of the spinal nerves through which the viscerosensory reflex reaches the peripheral skin segments.

Pain in the chest may include the entire rib cage, the shoulders, the neck and the arms. The internist concerns himself mainly in the differential diagnosis of those organic pains which involve the reflex mechanisms such as seen in Head zones (see table). The neurologist, on the other hand, considers in greater detail the distinctive distribution and qualities of pain originating in the roots of the spinal nerves. These cutaneous zones or painful areas on the chest occur at the periphery in a fairly definite pattern within the segmental distribution of the roots of the spinal nerves. Organic pains of this nature not involving the viscerosensory reflex mechanism may be grouped under the heading of the Radicular Syndrome (Radiculitis, Root Pains).

Local inflammations and local arthritides with pain in the shoulder and arm, or bursitis of the shoulder and elbow with pain are readily differentiated.

Arthritic changes in the vertebrae are widespread. The symptoms of root pain are apt to appear on the chest at the time of life when cardiac pain also makes its appearance. It is imperative that this common ailment should be recognized and easily differentiated from true cardiac pain. A description of the radiculitis associated with hypertrophic osteoarthritis of the spine will suffice to differentiate this general syndrome from the painful reflex of heart disease.

Heart pain at its onset is usually localized by the patient in the center of the chest in the region of the sternum. This area lies within the distribution of the second to the seventh skin segments of the spine, which, in turn, have their origin in the second to the seventh dorsal nerve roots of the spine. Cardiac pain is commonly referred from a position on the chest to other "Head" zones, namely, the axilla (D3), the inner side of the arm (D2), the forearm and the little finger (D1 and C8). Uncommon zones of reference are other parts of the shoulder girdle (C4 and C5), the jaw, the back and the epigastrium (D6-8). Therefore, it is readily understood how pain of nerve root origin, arising in the first to seventh dorsal roots which are distributed over the sternal region and chest, the axilla (D3) and the inner side of the arm (D2), the forearm (D1) and the little finger (C8), may be confused with this viscerosensory reflex. The latter may follow the pathway of the same spinal nerves and affect the same peripheral regions.

Root pain (non-visceral) occurs in band-like zones on the chest varying from one to several inches in width, i.e., narrow on the front of the chest and wider as it distributes posteriorly. THIS BAND-LIKE DISTRIBUTION IS CHARACTERISTIC OF THE ZONE OF PAIN OF ROOT ORIGIN. The patient may complain of pain in one or more of these bands around part or all of the circumference of the chest. Occasionally it localizes only in the front of the chest. When the pain occurs in one part of such a band or root zone, it generally will be found to occupy the full width and circumference of the root zone IN THE FRONT AS WELL AS IN THE BACK OF THE CHEST. Such a band-like distribution of symptoms defines radiculitis and is conclusive evidence that the origin of the painful disturbance is in the spinal nerve root and not in the viscera or in the peripheral nerve.

This distribution is in striking contrast to the pain of the cardio-viscerosensory reflex. Here, too, the pain is described over the front of the chest. It may cover a wide area in the region of the sternum, thus involving the distribution of several spinal nerve roots (D2 to D7). But when the pain radiates, IT JUMPS FROM ONE ROOT ZONE TO THE NEXT, THUS INVOLVING PARTS OF SEVERAL SUCH CONTIGUOUS BAND-LIKE ZONES WITHOUT HAVING COMPLETED THE ENTIRE DISTRIBUTION OF THE ORIGINAL SKIN SEGMENT IN WHICH IT FIRST APPEARED BEFORE IT SPREAD TO ITS NEIGHBOR. Thus, reference may occur to the inner side of the arm outside of these segments of origin, jumping to the first dorsal and eighth cervical zones **without ever radiating to the back of the chest to complete the distribution of the roots in which it had its onset.** THE FAILURE OF PAINFUL SUBJECTIVE SENSORY DISTURBANCES TO COMPLETE THE DISTRIBUTION OF THE SPINAL NERVE ROOTS IN WHICH IT BEGINS IS CHARACTERISTIC OF REFERRED VISCERAL PAIN AS SEEN IN THE CARDIAC VISCEROSENSORY REFLEX.

Memory for root pain is excellent, even for months after it has been bothersome. The patient will locate and delineate with his finger tips the upper and lower borders of the entire band-like zone as though he were drawing its distribution on himself. But memory for cardiac pain is poor. Its borders are outlined vaguely and its minutiae are described with difficulty. The fingers are not used accurately to draw a picture of the disturbance but, on the contrary, the patient indicates an area including parts of several nerve root skin segments, either by waving his hand over these zones or by placing the flat of his hand or his fist over the involved area.

Most instances of heart pain begin on the front of the chest and radiate to parts of the dorsal and cervical segments distributed on the inner side of the arm, forearm and finger. Rarely is this distribution and radiation reversed. Although the patient may center his attention on the front of the chest, especially the left side, most nerve root pains are apt to begin in the back and radiate forward on the chest wall or directly anteriorly. HEART PAIN RARELY BEGINS ON THE CHEST WALL LATERALLY TO, OR OUTSIDE OF THE NIPPLE LINE (MID-CLAVICULAR LINE), AND RARELY RADIATES FORWARD OR BACKWARD FROM SUCH A LATERALLY LOCATED REGION. ROOT PAIN, WHEREVER IT BEGINS ON THE CHEST WALL, RADIATES FORWARDS (ANTERIORLY) OR BACKWARDS (POSTERIORLY), AND ALWAYS RADIATES BEYOND THE NIPPLE LINE TO COMPLETE THE BAND-LIKE ZONE OF THE NERVE ROOT DISTRIBUTION.

Heart pain may occur also in the back but in such instances a small area is described between the shoulder blades in the second to the fourth dorsal segments, but here again a wide gap of uninvolved root zone still exists on the side of the chest between the painful area in the back and the main site of pain on the front of the chest. This type of radiation is quite comparable to other bizarre radiations, namely, to the neck (C3 and C4), the teeth, the gums, and the palate (Cranial 5 to Cranial 9).

The patient's description of root pain in its band-like zones is in such terms as "aching, soreness, bothersome, nagging," or as a paraesthesia, i.e., burning, tingling, and numbness which gives the impression of occurring in a plane or surface with very little depth. The period of radiation of this pain over the entire root distribution is almost instantaneous although often long sustained, and its level of intensity hardly varies between onset and cessation. Heart pain, on the other hand, is described as squeezing, crushing, vice-like and tearing, with the feeling of depth and volume of a third dimension. The severity and depth of heart pain is likely to increase with prolongation of the attack to a peak, and to break over or spread to adjacent or distant new root areas. Other visceral reflexes from the mediastinum, such as initiated by esophageal or cardiospasm, diaphragmatic hernia, etc., often spread along pathways similar to those of the cardiac viscerosensory reflex. The patient's description of his distress, however, is generally similar to that of surface pain seen in the radicular syndrome, namely, burning, numbness, tingling and sticking, although occasionally cramp-like.

The associated phenomena, such as nausea, vomiting, sweating, and changes in color encountered in cardiac and other mediastinal reflex pains, are not found to occur in root pain regardless of its intensity. Generally there are no demonstrable signs of his ailment displayed by the sufferer. An important differentiating test is that nerve root pain is not relieved (within 3 to 5 minutes) by nitrites, as commonly occurs in angina pectoris.

The factors which act as triggers to set off the cardiac viscerosensory reflex are extremely protean. However, they can be generally grouped under the headings of "physical exertion," "excitement" and "physical activity after a heavy meal." Sometimes pain occurs when the patient is quiet or during sleep. The causes of attacks of root pain are different. They are in general precipitated by "movements of the spinal column," which include postural defects and physical fatigue, and conditions which temporarily increase the intraspinal pressure, such as coughing, sneezing, yawning and straining at stool. Root pain may begin when the patient lifts his head from the pillow. He gets some relief from the bodily activity of walking about (presumably from spasm of the vertebral muscles and consequent support). On sitting down for rest, the pain may shortly return. After a day of recurrent bouts of nagging pain, he retires to bed and may get relief, especially if the bed is firm. Frequently, pain may awaken him and a shift of position will give some degree of comfort.

The heart pain occurring at night is easily distinguished from the nocturnal spinal root pain. The former is not affected by a change of position in bed, as often occurs in the latter condition. The onset of cardiac pain on exercise "pulls up" the patient and forces him to stop his activities. This does not occur in nerve root pain wherein a continuation of activity is no more than moderately uncomfortable.

Nerve root and visceral pain may and often do co-exist. Occasionally visceral pain may tend to follow the pathways apparently organized by a pre-existing radicular syndrome, such as from a long-standing spinal arthritis, and much care must be exercised in establishing the diagnosis. A knowledge of the latter syndrome enables one to evaluate chest pain for correct diagnosis since its common occurrence has so often been misinterpreted as angina pectoris or acute occlusion of the coronary artery.

I. **Non-organic Pains:—functional and psychic pattern pains**
   - The "red hot" needle, nipple point pains (Kilgore)
   - The needle point pains at the breast in vasovagal attacks (Albutt).
   - Precordial aching of neurocirculatory asthenia.
   - Occupational back pains of nurses, typists, etc.
   - Circular pains occupying part of the arc of the circle at the base of the breast or around the nipple, usually under and lateral to the breast.

II. **Organic Pains Involving the Viscerosensory Reflex.**
   1. From the mediastinum.
      - Angina pectoris.
      - Coronary artery occlusion.
      - Obstructive lesions of the esophagus.
      - Cardiospasm.
      - Diaphragmatic hernia into the mediastinum.
      - Acute pericarditis and acute mediastinitis.
   2. The pleural reflex.
      - Pleurisy in acute pulmonary and pleural inflammations.
      - Pulmonary embolism.
      - Spontaneous pneumothorax.
      - Shoulder and chest pain in diaphragmatic pleurisy, as in acute inflammations and tumors (including sub-diaphragmatic lesions). The left hypochondrium pain associated with aerophagia and distention of the colon.

III. **Root Pains (The radicular syndrome, radiculitis, segmental pain) or Organic Pains Not Involving the Viscerosensory Reflex.**
   - Arthritis of the dorsal and cervical spine.
   - Meningeal and nerve root tumors.
   - Tuberculosis of the vertebrae.
   - Erosions of the vertebrae by aneurysms, lymphoblastoma and other new growths.
   - Destructive lesions in the intervertebral discs, and vertebrae.
   - Compression fractures of the vertebrae (Kummel fracture).
   - Acute infections of the nerve roots and syphilis of the nerve root, without bony changes (Déjerine).
   - Acute virus infections as in Herpes Zoster.
   - Tabes dorsalis.
   - Scoliosis and muscle fatigue with static and postural root pains, without bony changes.

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